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Frozen aerated confection

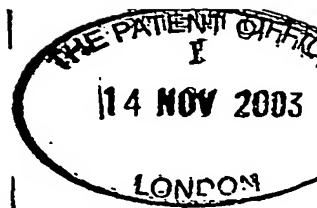
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### Frozen Aerated Confection

This invention relates to a frozen aerated confection. More specifically, the invention relates to an ice cream product which is soft and extensible at  $-18^{\circ}\text{C}$ .

US patent application publication 2001/0031304 A discloses a frozen aerated confection which exhibits an extensible character similar to that shown by a Turkish artisenal type of ice cream known as Maras. Maras ice cream comprises sahlep which is an extract from the roots of orchids and it is thought that it is sahlep which contributes to the extensible quality of Maras ice cream.

In US 2001/0031304 A, the frozen aerated confection does not comprise sahlep or any other product from orchids. Preferably, the confection comprises a polysaccharide such as xanthum gum, guar gum, or sodium carboxymethyl cellulose (CMC). In addition the confection preferably comprises one or more proteins selected from milk, soya or whey protein. The overrun of the confection is in the range 15-80%.

The inventors have observed that when the frozen aerated confection disclosed in US 2001/0031304 A is removed from a domestic freezer at  $-18^{\circ}\text{C}$ , it is not apparent to the consumer that the confection has an extensible quality because it is too hard. The extensible character of the confection only becomes apparent on softening the product by warming it to  $-12^{\circ}\text{C}$ .

A further problem with the confection disclosed in US 2001/0031304 A is that the extensibility generally decreases as the overrun increases beyond 30%.

This invention overcomes the aforementioned problems by providing, in a first aspect, a frozen aerated confection comprising at least

one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320, the confection having an extensibility of at least 30% at -18°C.

The number average molecular weight ( $M_n$ ) is a number weighted averaged molecular weight defined by the following equation:

$$M_n = \frac{\sum w_i}{\sum (w_i/M_i)} = \frac{\sum N_i M_i}{\sum N_i}$$

where  $w_i$  is the mass of species  $i$ ,  $M_i$  is the molar mass of species  $i$  and  $N_i$  is the number of moles of the species  $i$  of molar mass  $M_i$ . The mean number average molecular weight is the number average molecular weight of a blend of two or more, in this case, freezing point depressants.

At an extensibility of less than 30%, the consumer does not generally perceive the confection as being extensible. Therefore for the purposes of this invention, the term 'extensible confection' refers to a frozen aerated confection with an extensibility of at least 30%.

Without wishing to be bound by theory, the inventors have observed that the softness of a frozen aerated confection comprising at least one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320, is a function of the viscosity of the non-frozen matrix phase as well as the phase volume of ice. Since the viscosity of the non-frozen matrix phase and the ice phase volume are, in part, a function of the mean number average molecular weight of the at least one freezing point depressant, the

softness of the confection is, in part, determined by the mean number average molecular weight of the at least one freezing point depressant.

- 5 When the mean number average molecular weight of the at least one freezing point depressant is much in excess of 320 at a total freezing point depressant range of 26-40% weight by weight, the extensible character of the confection is maintained but is not apparent to the consumer at -18°C because the confection is too  
10 hard.

Thus by maintaining the total freezing point depressant in the range of 26-40% weight by weight and controlling the mean number average molecular weight of the one or more freezing point  
15 depressant at less than or equal to 320, the confection is soft enough when, removed directly from a domestic freezer, for the consumer to perceive any extensible character.

Freezing point depressants as defined in this invention consist of:  
20 monosaccharides; disaccharides; oligosaccharides containing from three to ten monosaccharide units joined in glycosidic linkage; corn syrups with a dextrose equivalent (DE) of greater than 20 preferably > 40 and more preferably > 60; glycerol; erythritol; arabitol; xylitol; sorbitol; mannitol; lactitol; malitol; or any  
25 combination thereof.

Corn syrups are complex multi-component sugar mixtures and the dextrose equivalent is a common industrial means of classification. Since they are complex mixtures their number average molecular  
30 weight ( $M_n$ ) can be calculated from the equation below (Journal of Food Engineering, 33 (1997) 221-226),

$$DE = 100 / M_n / 180.16$$

Preferably the total freezing point depressant range is 28-39% weight by weight and the mean number average molecular weight range is 200 to 300. In particular, the total freezing point depressant range is 29-36% weight by weight and the mean number average  
5 molecular weight range is 200 to 250.

Monosaccharides and disaccharides include sucrose, arabinose, ribose, xylose, dextrose, galactose, mannose, fructose, lactose, maltose, raffinose and stachyose.

10

Preferably the at least one freezing point depressant is 98% weight by weight monosaccharide, disaccharide, oligosaccharide and corn syrup. In particular the monosaccharide, disaccharide and corn syrup is selected from the group consisting of sucrose, dextrose,  
15 lactose, fructose, maltose and corn syrup of DE greater than or equal to 53.

The extensibility of the confection is preferably at least 40% at -18°C, and more preferably at least 50% at -18°C.

20

The frozen aerated confection may comprise an effective amount of one or more polysaccharide selected from the group consisting of xanthum gum, guar gum and sodium carboxymethyl cellulose. Preferably the polysaccharide is guar gum.

25

The confection may also include an effective amount of at least one protein. Preferably the protein is selected from the group consisting of milk protein, soya protein and whey protein.

30 The frozen aerated confection may also have an overrun in the range 0-120%, preferably 30-120%, more desirably 30-90%, particularly at least 80% and less than or equal to 120%. The overrun is the increase in volume of, for example, ice cream over the volume of the mix used due to the incorporation of air.

In a second aspect of the invention, a frozen aerated confection is provided comprising at least one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, an effective amount of one or more polysaccharide selected from the group consisting of xanthum gum, guar gum and sodium carboxymethyl cellulose, and an effective amount of at least one protein, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320.

Preferably the polysaccharide is guar gum at a level of 0.4-0.9% weight by weight.

Desirably the protein is at a level of 1-5% weight by weight and selected from the group consisting of milk protein, soya protein and whey protein.

Preferably the at least one freezing point depressant is 98% weight by weight monosaccharide, disaccharide, oligosaccharide and corn syrup. In particular the monosaccharide, disaccharide and corn syrup is selected from the group consisting of sucrose, dextrose, lactose, fructose, maltose and corn syrup of DE greater than or equal to 53.

Preferably the total freezing point depressant range is 28-39% weight by weight and the mean number average molecular weight range is 200 to 300. In particular the total freezing point depressant range is 29-36% weight by weight and the mean number average molecular weight range is 200 to 250.

The frozen aerated confection may also have an overrun in the range 0-120%, preferably 30-120%, more desirably 30-90%, particularly at least 80% and less than or equal to 120%. The overrun is the

increase in volume of, for example, ice cream over the volume of the mix used due to the incorporation of air.

#### Brief Description of the Figures

- 5 The invention will now be illustrated with reference to the figures in which:

Figure 1 shows a cutter used to stamp a test piece;

Figure 2 shows a test piece grip;

- 10 Figure 3 shows the arrangement of two grips with a metal gauge; and  
Figure 4 shows a test piece broken at the shoulder.

#### Test Procedures

- 15 In the examples that follow, the extensibility was measured using the following procedure.

- A 500 mm block of ice cream of dimensions 92 mm x 38 mm x 140 mm was removed from a cold store at -25°C and allowed to soften at 25°C. The block was cut into 10 mm wide strips using a serrated  
20 knife and following the pre-drawn guidelines on the block. Thus from one block, 14 strips having dimensions of 92 mm x 38 mm x 10 mm were cut off.

- The strips were placed on a silicon paper covered portable hard  
25 flat surface, for example a hard plastic chopping board. A shaped test piece was then stamped from each of the strips using a cutter which is shown in Figure 1. The cutter has an overall length of 80 mm and a width at its widest point adjacent the ends of 23 mm. An indented area (11) is defined substantially symmetrical about the  
30 middle point of the length of the cutter. The indented area has a width of 10 mm and a length of 60 mm.

The cutter was warmed in hot water at 50-60°C and at least 6 test pieces stamped from the aforementioned strips. The test pieces



were then returned to a cold store at  $-25^{\circ}\text{C}$  on the silicon paper and hardboard for a minimum of 90 minutes. As the test pieces should not be held at  $25^{\circ}\text{C}$  for more than 13 minutes, the time for cutting and stamping did not exceed 8 minutes.

5

The test pieces were then removed from the cold store at  $-25^{\circ}\text{C}$  and placed into test grips. The test grip design is shown in Figure 2 and comprises 2 Perspex<sup>™</sup> plates (21) joined together with a C clip (22) and a stainless steel pin (23), the C clip (22) comprising an  
10 M4 screw (24). Mounted on the opposing faces of each Perspex<sup>™</sup> plate (21) is a rubber pad (25), each of which has a dimpled surface. The distance from the distal end of the rubber pad to the C clip (22) is 25 mm and the spacing between the rubber pads (25) is 23 mm. The width of each rubber pad (25) is 18 mm. The rubber  
15 pads (25) comprise Foulds conveyor belt material model V100 two-ply polyester with a polyvinyl chloride top surface. The rubber pads are (25) attached to the Perspex<sup>™</sup> plates (21) with adhesive whereby the dimpled surface of each rubber pad (25) is free to grip the test pieces.

20

One test grip (33) was placed on each end of the test piece (32) as shown in Figure 3. The rubber pads (25) were closed to a gap no smaller than 8 mm. A metal gauge (31) was used to ensure that the pair of grips were correctly located ensuring the distance between  
25 the two grips was 60 mm.

In Figure 3, the metal gauge (31) is shown attached to a pair of test grips (33) holding a test piece (32). The metal gauge (31) has a total length of 136 mm and set the distance between the axes  
30 of each C clip at 120 mm. The test piece, test grips and metal gauge were then placed in a portable freezer set at  $-18^{\circ}\text{C}$  for 10-120 minutes.

Testing was conducted on an Instron 4501 mechanical test machine fitted with a 10 N load cell. The test was conducted within a temperature control cabinet set to  $-18^{\circ}\text{C}$ . After the test piece was attached to the mechanical test machine via the test grips, the metal gauge was removed and the test piece allowed to equilibrate at  $-18^{\circ}\text{C}$  for 2 minutes before the test was performed.

The test was performed by pulling the test piece apart with the test grips moving away from each other at a relative speed of 50 mm per minute. The force ( $F$ ) required to pull the test piece and the displacement of the test grips ( $\Delta L$ ) were continually recorded during the test. Any test in which the test piece slipped within either grip or broke at the shoulder (41) of the test piece as shown in Figure 4 was rejected. The test was completed when the test piece is broke. A minimum of 6 valid tests was required to provide a measurement of extensibility for a test ice cream.

The displacement of the test grips at which the force drops to zero after passing through a maximum load is the point at which the failure of the test piece occurs.

A percentage strain to failure  $E_f$  is defined as the displacement to failure divided by the original gauge length of test piece ( $L_0$ ) multiplied by 100. The original gauge length is that portion of the test piece which is 10 mm wide, thus the original gauge length is 60 mm. The mean percentage strain to failure of at least 6 valid tests defines the extensibility of the ice cream under test.

Mechanical firmness was measured in accordance with the following procedure.

Mechanical firmness provides an indication of softness. Mechanical firmness is given by the maximum true stress ( $\text{Pa}$ ) which can be obtained from a true stress versus true strain curve (Richards,

C.W. (1961) *Engineering materials science*. Brooks/Cole Publishing, Belmont, MA; Green, D.J. (1998) *An introduction to the mechanical properties of ceramics*. Cambridge University Press, Cambridge, UK).

- 5 The true stress ( $\sigma_t$ ) can be calculated from the force measurements obtained from the extensibility test and is given by

$$\sigma_t = F(L_0 + \Delta L) / (A_0 L_0)$$

- 10 where  $A_0$  is the cross-sectional area of the original gauge length.

The true strain ( $\epsilon_t$ ) is given by

$$\epsilon_t = \ln((L_0 + \Delta L) / L_0)$$

15

The texture profile was determined by a sensory panel of 10 or more trained assessors.

- The technique employed combined aspects of both the Spectrum<sup>TM</sup> and  
20 Texture Profile<sup>TM</sup> methodologies (Lawless, H.T. and Heymann, H. (1999) *Sensory evaluation of food: principles and practices*. Chapman & Hall, London; Meilgaard, M., Civille, G.V. and Carr, B.T. (1991) *Sensory evaluation techniques* - 2<sup>nd</sup> edition. CRC Press, London). The technique is a descriptive method to describe the  
25 textural characteristics of most food products during consumption. The eating procedure, technical lexicon and scales are all standardised, with a number of reference products along each scale to enable the quantitative rating of intensity relative to all foods.

30

The trial involved a three replicate assessment. Samples were served in plastic pots at -18°C and the trained assessors were asked to assess the attributes listed in table 1 hereinbelow in accordance with the procedure set out in the same table. The data

was analysed using ANOVA (analysis of variance) and multiple comparison testing. The accepted significance level was 5% or  $p < 0.05$ .

- 5 In relation to the firmness of the ice creams, the most relevant attributes are firmness (semi-solid) and hardness/firmness (solid).

Table 1: Sensory Attributes

Assessment	Attribute	So/SS	Definition	Evaluation Procedure	Anchors	References
First manipulation	Firmness	SS	Force required to compress between tongue and palate	Place $\frac{1}{4}$ tsp of sample in mouth and compress between tongue and palate	Low (soft) High (firm)	Whipped cream: 2 Cream cheese: 8-9 Paté: 14
	Hardness/ Firmness	So	Force required to bite through the sample	Bite through the sample with the incisors	Low (very soft) High (very hard)	Cream cheese: 1 Hard mature cheddar: 7.5 Almond: 11 Hard candy: 14.5

So = solid

SS = semi-solid

**Examples**

Ice cream was prepared to the formulations set out in table 2 hereinbelow and tested in accordance with the test procedures set forth hereinabove.

5

Comparative example 1 was a non-extensible ice cream and comparative example 2 was a standard extensible ice cream.

10

The mean number average molecular weight of the freezing point depressants (FPD) were calculated from the equation set forth hereinabove. Total protein content (not shown) and freezing point depressant content (not shown) were also calculated by simple arithmetic.

15

Ice creams were prepared to the formulations set out in table 2 in accordance with the following procedure.

20

All the ingredients were blended together in an agitated heated mix tank after which the blend was subjected to high shear mixing at a temperature of at least 65°C for 2 minutes in order to hydrate the stabilisers. Excessive temperature was avoided to prevent damage to heat labile components and the formation of cooked off flavours.

25

The blend was then subjected to homogenisation to reduce the bulk of the fat droplets to below 1µm in diameter by homogenising at a pressure of 150bar and a temperature of 70°C using a valve homogeniser.

30

As examples 1 and 2 and comparative example 2 were rather viscous due to their high levels of guar, they were heated to 80°C prior to homogenisation to facilitate processing thereby enabling the blends to flow more readily through the pasteuriser and the homogeniser.

In order to conform to public health requirements the blend was pasteurised by heated the blend to 83°C and holding for 20 seconds. The pasteurised blend was then rapidly cooled to a chill temperature of 4°C. The blend was then held at 4°C to age.

Table 2: Ice Cream Formulations

Ingredients	Comparative example 1		Comparative example 2		Example 1		Example 2		Example 3	
	%		%		%		%		%	
CNO	9		8.2		-		-		5	
Butterfat	-		-		4		4		-	
SMP	7.4		7.88		8		8		8	
Whey solids	2.6		-		-		-		-	
MGP	0.39		0.4		0.15		0.15		0.15	
Sucrose	13.9		14		8.1250		8.125		12.5	
Dextrose	-		-		19.350		23.5		19.4	
Fructose	-		-		-		-		-	
Glycerol	-		-		-		-		-	
65 DE corn syrup	-		8		-		-		-	
LF9 corn syrup (63 DE)	4.6		-		-		-		-	
MD40	-		2		-		-		-	
Lactose	-		-		4.3750		-		-	
LBG	0.2840		-		-		-		-	
Carrageenan C	0.0410		-		-		-		-	
Guar gum	-		0.7		0.72		0.72		0.72	
Flavour	0.285		-		-		-		0.1125	
Beta Carotene	0.0013		-		-		-		-	
Turmeric	-		-		-		-		0.13	
Colour	-		-		-		-		0.15	
Water	61.4987		58.82		55.255		55.25		53.875	
Total FPD	22.69		26.30		34.25		33.65		34.29	
Total protein	3.37		2.76		2.80		2.80		2.80	
FPD mean $M_n$	332.0		329.1		234.1		217.8		234.0	



Table 2: Ice Cream Formulations

Ingredients	Example 4	Example 5	Example 6	Example 7	Example 8
	%	%	%	%	%
CNO	-	-	-	-	-
Butterfat	4	4	4	4	4
SMP	8	8	8	8	8
Whey solids	-	-	-	-	-
MGP	0.15	0.15	0.15	0.15	0.15
Sucrose	-	-	29	20.7	4.0625
Dextrose	-	-	-	-	19.375
Fructose	28.5	19.7	5.94	4.446	-
Glycerol	2	2	-	-	-
65 DE corn syrup	-	-	-	-	10.2
LF9 corn syrup (63 DE)	-	-	-	-	-
MD40	-	-	-	-	-
Lactose	-	-	-	-	-
IBG	-	-	-	-	-
Carrageenan C	-	-	-	-	-
Guar	0.72	0.72	0.72	0.72	0.72
Flavour	-	-	-	-	-
Beta Carotene	-	-	-	-	-
Turneric	-	-	-	-	-
Colour	-	-	-	-	-
Water	56.62	65.42	52.18	61.974	53.4825
Total FPD	34.66	25.86	39.10	29.30	33.79
Total protein	2.80	2.80	2.80	2.80	2.80
FPD mean $M_n$	180.5	180.6	301.0	301.0	224.5

CNO = coconut oil

LF9 glucose syrup (63 DE) = 63 DE corn syrup at 78% weight by weight solids

SMP = skimmed milk powder (52% weight by weight lactose and 35% weight by weight milk protein)

MGP = monoglyceryl palmitate (emulsifier)

MD40 = DE 40 corn syrup at 95% weight by weight solids

LBG = locust bean gum

65 DE corn syrup = 65 DE corn syrup at 80% weight by weight solids

Whey solids = Esprion 300 (52% weight by weight lactose and 30% weight by weight whey protein)

Dextrose = dextrose monohydrate

The blend was then frozen using a continuous freezer known as a votator or scrape surface heat exchanger. These devices freeze the blend and incorporate sufficient air to deliver the desired overrun. The devices were operated at  $-10^{\circ}\text{C}$ .

5

Following freezing the ice cream was subjected to hardening by blast freezing to  $-35^{\circ}\text{C}$  thereby reducing the temperature of the ice cream to close to the final storage temperature of  $-25^{\circ}\text{C}$ .

## 10 Results

The results of extensibility tests are shown in table 3. Both example 1 and comparative example 2 were prepared at 30% overruns. Comparative example 1 was prepared at 60% overrun.

15 Table 3: Extensibility Measurements

	Overrun (%)	% Mean Strain to Failure	Standard Deviation
Comparative example 2	30	134	72
Example 1	30	155	65
Example 2	30	83	32
Comparative example 1	60	13	2

The results show that the extensibility of example 1 is comparable to comparative example 2, which is the standard extensible ice cream. Comparative example 1, which is the non-extensible ice cream, exhibited very low values of extensibility.

20

Extensibility measurements were also carried out on example 1 and comparative example 2 at overruns of 30%, 50%, 100% and 120%. The results are summarised in table 4 hereinbelow.

25

Table 4: Extensibility as a Function of Overrun

	Overrun (%)	% Mean Strain to Failure	Standard Deviation
Comparative Example 1	30	113	31
	50	60	13
	100	50	27
	120	54	21
Example 1	30	156	65
	50	124	44
	100	82	24
	120	125	56

In table 4, it is apparent how increasing the overrun leads to a decrease in the extensibility of comparative example 2 (the standard extensible ice cream). In comparison, and rather surprisingly, the extensibility of example 1 remains relatively stable on increasing the overrun.

The results of the mechanical firmness tests are shown in table 5. The data recorded during the extensibility tests was used to calculate the true stress ( $\sigma_t$ ) and true strain ( $\epsilon_t$ ) values in accordance with the method set forth hereinabove.

Table 5: Maximum True Stress Measurements

	Comparative Example 1	Comparative Example 2 (30% overrun)		Example 1 (30% overrun)		Example 2 (30% overrun)
		Sample 1	Sample 2	Sample 1	Sample 2	
	14865	17589	17650.5	4104	4563	4035
	27120	16148	16099.9	3833	5119	3832
	14439	24374	15353.3	3670	4259	3670
	16231	21836	18405	4032	3482	4101
	19629	15450	11255.56	4533	5414	4522
	17581	18302	11632.12	5130	6322	5130
	28840	11108	24350.43	8038	9551	3617
		11571	21836	6732		8038
		9705				6687
Average	19815	16231	17073	5009	5530	4848
Standard deviation	5861	4937	4553	1574	1989	1538

Table 5 shows that examples 1 and 2 are softer than comparative example 2 (the standard extensible ice cream) at  $-18^{\circ}\text{C}$ . Examples 1 and 2 are also softer than comparative example 1 at  $-18^{\circ}\text{C}$ .

- 5 The results of the texture profile are summarised in table 6 hereinbelow.

Table 6: Texture Profile Measurements

10

Attribute	Comparative Example 1	Comparative Example 2 (30% overrun)	Example 1 (30% overrun)	Comparative Example 2 (100% overrun)	Maximum least significant difference
Firmness (semi- solid)	9.19	11.16	6.52	5.58	1.3
Hardness/ firmness (solid)	3.61	5.47	2.47	2.22	1.09

Example 1 at 30% and 100% overrun were not significantly different from each other but were significantly less firm than the comparative examples.

15

Examples 3 to 8 were tested non-mechanically (manually) and observed to display extensible character at  $-18^{\circ}\text{C}$ .

**Claims**

1. A frozen aerated confection comprising at least one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320, the confection having an extensibility of at least 30% at  $-18^{\circ}\text{C}$ .  
5
2. A frozen aerated confection according to claim 1 wherein the total freezing point depressant range is 28-39% weight by weight and the mean number average molecular weight range of 200 to 300.  
10
3. A frozen aerated confection according to claim 2 wherein the total freezing point depressant range is 29-36% weight by weight and the mean number average molecular weight range of 200 to 250.  
15
4. A frozen aerated confection according to claims 1 to 3 wherein the extensibility of the confection is at least 40% at  $-18^{\circ}\text{C}$ .  
20
5. A frozen aerated confection according to claim 4 wherein the extensibility of the confection is at least 50% at  $-18^{\circ}\text{C}$ .  
25
6. A frozen aerated confection according to any one of the preceding claims wherein the at least one freezing point depressant is 98% weight by weight monosaccharide, disaccharide, oligosaccharide and corn syrup.  
30

7. A frozen aerated confection according to claim 6 wherein the monosaccharide, disaccharide and corn syrup is selected from the group consisting of sucrose, dextrose, lactose, fructose, maltose and corn syrup of DE greater than or equal to 53.
- 5
8. A frozen aerated confection according to any one of the preceding claims wherein the confection comprises an effective amount of one or more polysaccharide selected from the group consisting of xanthum gum, guar gum and sodium carboxymethyl cellulose.
- 10
9. A frozen aerated confection according to claim 8 wherein the polysaccharide is guar gum.
- 15
10. A frozen aerated confection according to any one of the preceding claims comprising an effective amount of at least one protein.
- 20
11. A frozen aerated confection according to claim 10 wherein the protein is selected from the group consisting of milk protein, soya protein and whey protein.
- 25
12. A frozen aerated confection according to any one of the preceding claims wherein the confection has an overrun in the range 0-120%.
13. A frozen aerated confection according to claim 12 wherein the confection has an overrun in the range 30-120%.
- 30
14. A frozen aerated confection according to claim 13 wherein the confection has an overrun in the range 30-90%.

15. A frozen aerated confection according to claim 13 wherein the confection has an overrun of at least 80% and less than or equal to 120%.
- 5 16. A frozen aerated confection comprising at least one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, an effective amount of one or more polysaccharide selected from the group consisting of xanthum gum, guar gum and sodium carboxymethyl cellulose, and  
10 an effective amount of at least one protein, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320.
- 15 17. A frozen aerated confection according to claim 16 wherein the polysaccharide is guar gum at a level of 0.4-0.9% weight by weight.
- 20 18. A frozen aerated confection according to claim 16 or claim 17 wherein the protein is at a level of 1-5% weight by weight and selected from the group consisting of milk protein, soya protein and whey protein.
- 25 19. A frozen aerated confection according to claims 16 to 18 wherein the total freezing point depressant range is 28-39% weight by weight and the mean number average molecular weight range of 200 to 300.
- 30 20. A frozen aerated confection according to claim 19 wherein the total freezing point depressant range is 29-36% weight by weight and the mean number average molecular weight range of 200 to 250.



21. A frozen aerated confection according to any one claims 16 to 20 wherein the at least one freezing point depressant is 98% weight by weight monosaccharide, disaccharide, oligosaccharide and corn syrup.

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22. A frozen aerated confection according to claim 21 wherein the monosaccharide, disaccharide and corn syrup is selected from the group consisting of sucrose, dextrose, lactose, fructose, maltose and corn syrup of DE greater than or equal to 53.

10

23. A frozen aerated confection according to any one of claims 16 to 22 wherein the confection has an overrun in the range 0-120%.

15 24. A frozen aerated confection according to claim 23 wherein the confection has an overrun in the range 30-120%.

25. A frozen aerated confection according to claim 24 wherein the confection has an overrun in the range 30-90%.

20

26. A frozen aerated confection according to claim 24 wherein the confection has an overrun of at least 80% and less than or equal to 120%.



**ABSTRACT**

**FROZEN AERATED CONFECTION**

- 5 A frozen aerated confection comprising at least one freezing point depressant at a total freezing point depressant range of 26-40% weight by weight, the at least one freezing point depressant having a mean number average molecular weight of less than or equal to 320, the confection having an extensibility of at least 30% at -
- 10 18°C



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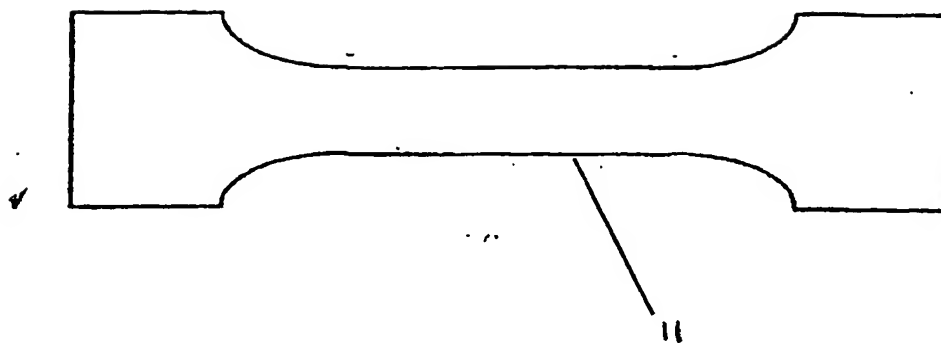


Figure 1.

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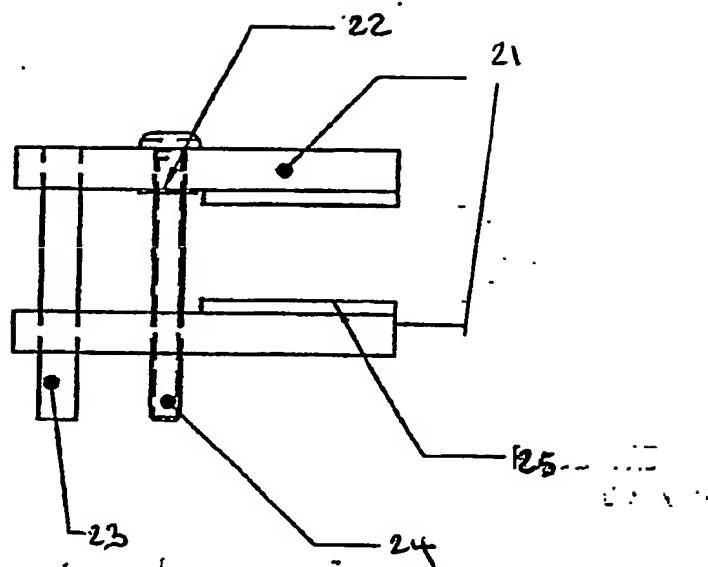


FIGURE 2

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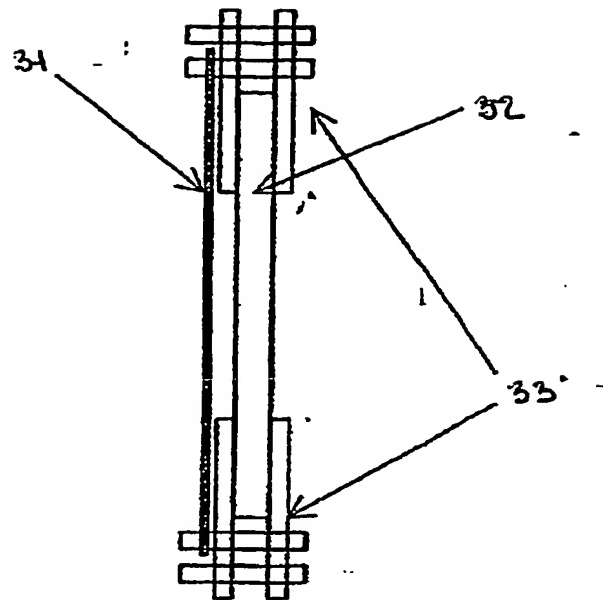


Figure 3

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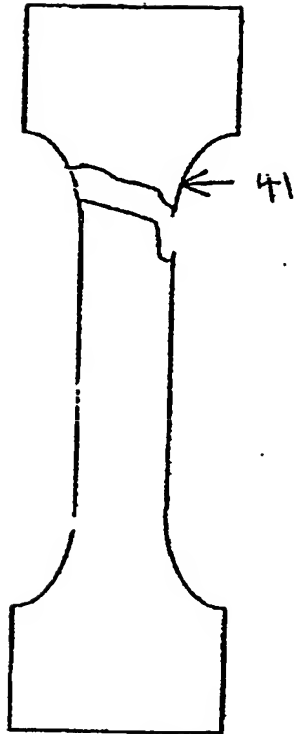


Figure 4

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